

don, Ind., 8 to 10 p. m., bright arch. Lansing, Mich., during evening. Riley, Ill., 7.20 to 10.30 p. m., bright arch, altitude 14°. Elmira, Ill., 9 p. m., faint bluish light, with streamers. Morrison, Ill., during evening. Dubuque, 7.10 to 10.30 p. m., very brilliant, altitude 30°; extended from N. 20° W. to N. 30° E. Beloit, Wis., during evening. Franklin, Wis., during evening. LaCrosse, 8.30 p. m. to 4 a. m. of 20th. St. Paul, 9 to 11.30 p. m., bright arch of pale yellow, altitude from 10° to 15°, no streamers. Northfield, Minn., 6 p. m. to 6 a. m. of 20th, Guttenburg, Ia., 7 to 10 p. m. Clinton, Ia., during evening, bright arch, altitude 20°, no streamers. Cresco, Ia., 7 to 10.30 p. m., diffuse light extending from NNW. to ENE. Monticello, Ia., during evening. Des Moines, 7 p. m., bright arch with dark segment below. Moorhead, Minn., 8 to 11 p. m., bright arch of pale yellow. Bismarck, 6 p. m. to morning of 20th, Rapid City, Dak., 7 to 10.30 p. m. Ft. Meade, Dak., during evening. The next most important display was that of the 14th, the line of observation extending eastward from Cape Breton Island to Dakota, the following stations reporting: Charlottetown, P.E.I., during evening. Fredericton, N.B., during evening. Eastport, 11.30 p. m., to midnight; diffuse light. Newport, R. I., 10.15 p. m., to morning of 20th, diffuse light; a few streamers rose to an altitude of 15° or 20°, but lasted only a few moments. Burlington, Vt., 11 to 11.45 p. m., bright arch with streamers reaching an altitude of 25°; no dark segment. Cambridge, Mass., 7.30 to 10.30 p. m. Southington, Conn., 9 p. m., faint light low down upon the horizon. Waterburg, N. Y., 9.30 p. m. Rochester, 10 to 11 p. m., faint light. Toronto, during evening. Lansing, Mich., during evening. Clear Creek, Neb., 9 p. m., faint light. St. Vincent, 7 to 11 p. m., very brilliant, with two arches; light frequently reached the zenith; forks of light characteristic of merry dancers extended along both arches; they increased in brilliancy on the western quarter of the arches and gradually faded away as they approached the eastern quarter. The following, with the exception of the 11th, were local displays: Fredericton, N. B., 15th. St. John, N. B., 15th. Eastport, 15th, 8.30 to 9.10 p. m., bright arch with several streamers, some of which shot upward to a height of 30°. Contookville, N. H., 11th, diffuse light. Thatcher's Island, 15th, 7 to 7.10 p. m., faint light. Cambridge, Mass., 11th, aurora suspected at 9.30 p. m. and at 11 p. m., a broken arch with a few streamers became visible. Southington, Conn., 11th, 9 p. m., faint light. Atco, N. J., 24th, 8 p. m., two faint arches resembling a double rainbow; no dark segment. Gardiner, Me., 11th, 8.30 p. m. to 12.30 a. m. of the 12th; 30th, 4.30 a. m. Dexter, Me., 12th. Waterburg, N. Y., 11th. Catawissa, Pa., 22d. Toronto, 11th. Rochester, 11th, 9 to 11.30 p. m., diffuse light. New Corydon, Ind., 23d, 6 p. m. to 2.30 a. m. of the 24th, three well defined arches, altitude, 30°; 24th, from early evening to morning of 25th. Lansing, Mich., 11th, during evening. Northport, Mich., 11th, 9 p. m. Alpena, 11th, 8.30 p. m. to 12.40 a. m. of 12th, diffuse light with a few streamers occasionally reaching near zenith. Grand Haven, 11th, 10 p. m. to 1.30 a. m. of 12th, resembling morning dawn. Beloit, Wis., 11th, during evening. Franklin, Wis., 11th, during evening. Cresco, Iowa, 11th, 8.30 to 9.30 p. m., faint light. Northfield, Minn., 11th, 9.15 to 10.20 p. m., bright streamers occasionally reaching an altitude of 45°. Cedar Rapids, Iowa, 13th; Clear Creek, Neb., 1st, faint light. St. Vincent, 10th, 8 to 11 p. m., diffuse light with a slight lateral motion; 23d, 7 to 11 p. m., faint light. Phelps, N. Y., 21st, bright arch of bluish white, altitude about 23° with an azimuth of over 110°; this condition remained intact for about two hours, when the arch broke into a number of large beams, having a slow but uniform motion eastward; light sufficiently brilliant to cast distinct shadows upon the snow.

**Zodiacal Light.**—Nashville, 9th, 11th, 14th; St. Vincent, Minn., 9th; Springfield, Ill., 14th; Dayton, Wash. Ty., 17th, 18th, 20th; Rio Vista, Cal., 16th to 20th; New Corydon, Ind., 9th, 14th, 17th, 19th; Clinton, Ia., 9th, 11th, 13th, 14th, 16th, 17th; Cresco, Ia., 8th, 11th, 14th, 16th, 18th, 19th, 21st, 22d; Monticello, Ia., 9th, 10th, 13th, 14th, 16th, 17th, 18th, 21st;

Yates Centre, Kan., 15th, 17th, 18th, 21st, 22d; Cambridge, Mass., 7th, 9th, 11th, 12th, 14th, 15th, 17th, 19th, 22d, 27th; Rowe, Mass., 19th; Clear Creek, Nebr., 8th, 10th, 11th, 13th, 14th, 16th to 21st; Bellefontaine, O., 14th; Stateburg, S. C., 15th, 16th; Wytheville, Va., 14th; Franklin, Wis., 11th, 12th, 13th.

**Thunder-storms.**—They were reported in the various districts as follows: Middle Atlantic States, Fallston, Md., 16th; South Atlantic States, 1st, 21st, 28th; East Gulf States, 8th, 10th, 13th, 27th, 28th; West Gulf States, 13th, 27th; Tennessee, Ashwood, 12th; Ohio Valley, 2d, 6th, 7th; Upper Lake Region, 8th, 26th; Upper Mississippi Valley, 2d, 6th, 7th, 8th, 26th; Lower Missouri Valley, 6th, 7th, 8th, 10th, 12th, 13th; Southern Slope, Jacksboro, Tex., 16th, 27th; Pacific Coast, San Diego, 12th, Red Bluff, 23d; San Francisco, 24th.

**Atmospheric Electricity Interfering with Telegraphic Communication.**—Bismarck, Dak., 19th, "sufficiently strong so that telegraph operator was able to work an open wire without the aid of battery. The current was so violent that it scorched the rubber covering of the wires and filled the room with the stench of burning compound. In placing the ends of the positive and negative wires together, a bright light about the size of a large shirt button was created, which rapidly revolved between the butts, illuminated the office."

### OPTICAL PHENOMENA.

**Solar halos** have been observed in the various districts on the following dates: New England, 1st, 5th, 10th, 12th, 16th, 18th, 20th, 21st, 28th, 31st; Middle Atlantic States, 1st, 4th, 10th, 12th, 15th, 16th, 19th, 27th, 30th; South Atlantic States, Hatteras, 21st; East Gulf States, Pensacola, 19th, 23d; West Gulf States, Little Rock, 14th; Rio Grande Valley, Eagle Pass, 3d; Ohio Valley and Tennessee, 1st, 9th, 11th, 14th, 15th, 17th, 19th, 23d, 24th, 27th, 29th, 30th and 31st; Lower Lake Region, 12th, 15th, 18th, 25th; Upper Lake Region, 3d, 4th, 5th, 12th, 14th, 16th, 18th, 19th, 23d, 24th, 27th, 28th; Extreme Northwest, Moorhead, Minn., 20th; Upper Mississippi Valley, 1st to 6th, 9th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 23d, 26th, 27th, 28th, 29th, 30th; Missouri Valley, 2d, 11th, 12th, 13th, 14th, 17th, 19th, 27th to 30th; Northern Slope, Rapid City, Dak., 3d; Deadwood, 27th, and North Platte, 29th; Middle Slope, 19th, 23d, 25th, 28th, 29th; Southern Plateau, Florence, Ariz., 4th, 7th; Middle Plateau, Pioche, 18th; Salt Lake City, 18th, 22d; Pacific Coast Regions, San Francisco, 3d, 9th, 11th, 15th, 22d, 28th; Poway, Cal., 27th; Sacramento, 22d, San Diego, 7th, 27th; Eola, Or., 29th.

**Lunar halos** have been observed in the various districts on the following dates: New England, 1st, 3d, 4th, 7th, 18th, 22d, 24th, 25th, 27th, 31st; Middle Atlantic States, 2d to 5th, 10th, 12th, 14th, 15th, 22d, 23d, 24th, 26th to 31st; South Atlantic States, 1st, 4th, 5th, 6th, 23d, 24th, 25th, 27th, 28th, 29th; Florida Peninsula, Key West, 24th; East Gulf States, 3d to 6th, 23d, 26th, 27th, 28th; West Gulf States, 1st to 4th, 6th, 9th, 25th to 28th, 31st; Rio Grande Valley, 2d, 3d, 4th; Ohio Valley and Tennessee, 1st, 3d, 6th, 12th, 23d, 24th, 26th, 27th, 28th, 29th, 30th, 31st; Lower Lake Region, 4th, 5th, 7th, 10th, 12th, 24th, 27th, 28th, 29th, 31st; Upper Lake Region, 1st to 5th, 8th, 9th, 10th, 14th, 15th, 19th, 23d, 27th, 29th, 30th, 31st; Extreme Northwest, 2d, 3d, 10th, 30th; Upper Mississippi Valley, 2d, 3d, 6th, 8th, 9th, 12th, 13th, 23d, 26th to 31st; Missouri Valley, 1st, 2d, 3d, 10th, 12th, 22d, 23d, 25th to 29th, 31st; Northern Slope, 1st, 4th, 11th, 13th, 22d, 23d, 25th, 26th, 29th, 31st; Middle Slope, 1st to 7th, 10th, 24th, 25th, 27th, 28th, 29th; Southern Plateau, 2d, to 6th, 27th to 31st; Middle Plateau, 1st, 3d, 4th, 5th, 24th, 26th, 29th, 30th; Northern Plateau, 24th, 29th, 30th, 31st; North Pacific Coast, 11th, 29th, 31st; Middle Pacific Coast, 5th, 11th, 22d, 27th, 30th; South Pacific Coast, Yuma, 2d, 5th, 13th, 28th; Poway, Cal., 27th. Exceptionally brilliant displays were observed at Pioche, Nev., on the 3d, from 7 p. m. to midnight, and at Council Bluffs, Ia., on the 31st, from about 8 to 11 p. m.. The parhelic circle with the accompanying paraselenæ were present in both instances.

**Mirage.**—Indianola, 1st, 10th, 18th, 19th, 21st, 31st. Huron, Dak., 11th, a. m., on the eastern horizon, making the town of Iroquois, 22 miles distant, visible through the telescope; houses, barns, haystacks, etc., were distinctly seen. The phenomenon lasted 55 minutes. 31st, 7.30 to 8.30 a. m., mirage making objects 30 miles distant, visible to the naked eye; with the aid of a telescope, small trees could be distinguished in the gulches of the Wessington Hills, 30 miles distant. Council Grove, Kan., 11th, 17th 31st. Northport, Mich., 29th.

### MISCELLANEOUS PHENOMENA.

**Sunsets.**—The characteristics of the sky as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 187 stations show 5,756 observations to have been made, of which 34 were reported doubtful; of the remainder, 5,722, or 83.3 per cent., were followed by the expected weather.

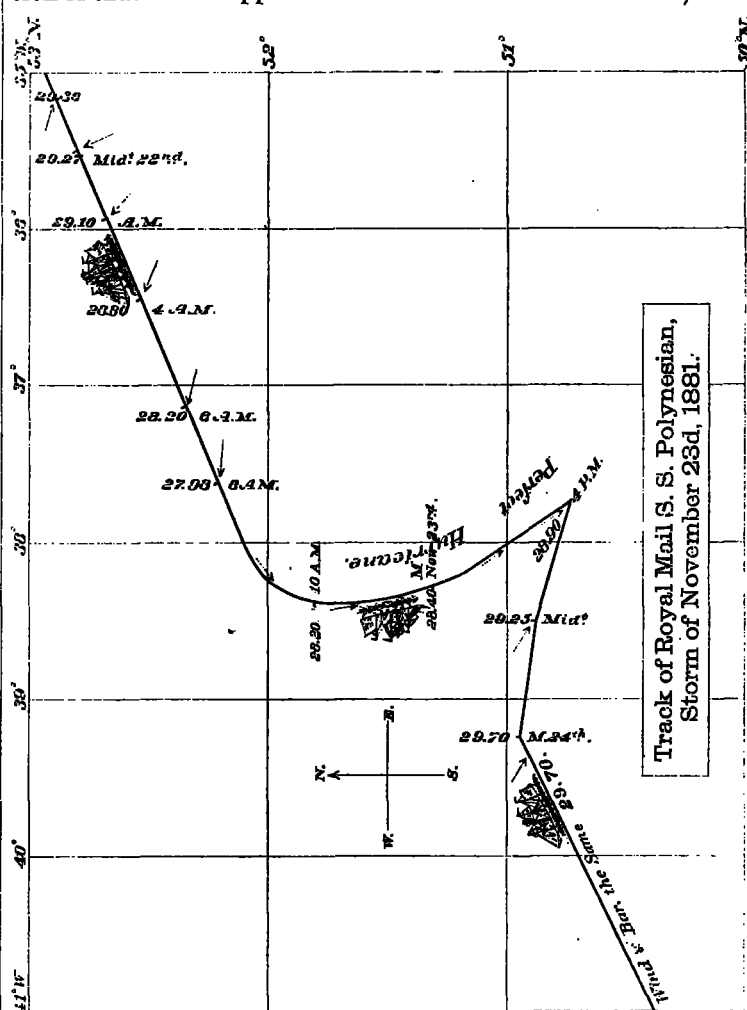
**Sun Spots.**—The following record of observations has been forwarded by Mr. D. P. Todd, Director of the Lawrence Observatory, Amherst, Mass.:

DATE— Jan., 1882.	No. of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		REMARKS.
	Grps.	Spots	Grps.	Spots	Grps.	Spots	Grps.	Spots	
2, 2 p. m.	0	0	0	0	0	0	2	15	
3, 10 a. m.	0	0	0	0	0	0	2	15	
5, 11 a. m.	1	5	0	0	0	0	3	20†	
7, 12 m.	0	0	1	5	0	0	2	15	
9, 3 p. m.	1	5	0	5	1	5	3	15	
10, 11 a. m.	1	2	0	5	1	2	4	12	
12, 9 a. m.	1	3	1	4	1	4	4	16	
14, 9 a. m.	0	6	0	2	0	6	4	20	
15, 10 a. m.	0	4	0	0	0	0	3	20	
17, 1 p. m.	1	2	1	8	0	0	3	12	
18, 10 a. m.	1	6	0	0	1	2	4	18	
19, 12 m.	1	2	0	0	0	0	5	20	
22, 12 m.	1	9	0	0	0	0	4	12	
23, 1 p. m.	1	2	0	2	1	2	4	12	
24, 12 m.	1	1	1	2	1	1	4	11	
27, 10 a. m.	1	8	0	0	0	0	4	20†	
30, 12 m.	0	5	0	0	0	0	4	25†	
30, 2 p. m.	0	0	0	5	0	0	4	20†	

†Approximated. Faculae were seen at the time of every observation.

Mr. William Dawson, at Spiceland, Ind., reports: 9th, 3 groups, 6 spots, 2 spots at east edge, 2 at west, and 2 north of centre; air very poor; power 36. 14th, 4 groups, 23 spots; air poor; power 50. 17th, 3 groups, 5 spots; air poor; power 50. 27th, 4 groups, 30 spots, one large spot near east and another near west edge; air tolerably good; power 100. 30th, 5 groups, 57 spots; air good; power 100. Mr. H. D. Govey, at North Lewisburg, O., reports: sun spots were observed on 2nd, 9th, 14th, 17th, 22nd, 23rd, 24th, 27th, 30th, or on every clear day during the month; they were least numerous on the 9th, and largest on the 30th. The following record of observations has been forwarded by Mr. A. G. Bender, Sacramento, Cal.: 6th, 12 m., 1 group, 10 spots. 7th, 12 m., 1 group, 7 spots. 8th, 12 m., 1 group, 6 spots. 9th, 12 m., 1 group, 2 spots; 1 group and 6 spots disappeared by solar rotation. 10th, 12 m., 1 group, 2 spots; filmy clouds probably prevented the observation of some of the smaller spots. 11th, 12 m., 3 groups and 8 spots; 2 groups and 5 spots, new. 12th, 12 m., 3 groups, 8 spots. 13th, 12 m., 3 groups, 6 spots. 14th, 12 m., 2 groups, 10 spots, 1 group disappeared. 16th, 12 m., 2 groups, 8 spots; 2 spots disappeared. 17th, 12 m., 2 groups, 4 spots; 2 groups, each with one large and 10 small spots. 18th, 12 m., 2 groups, 4 spots. 19th, 12 m., 1 new group, and 2 spots; 1 group and 2 spots disappeared by solar rotation; both spots in new group, large and near together. 20th, 12 m., 2 groups and 2 spots. 21st, 12 m., 3 groups and 8 spots; 1 group and 3 spots new. 24th, 12 m., 3 groups and 4 spots; 1 group and 2 spots new, and the same number of each disappeared by solar rotation. 25th, 12 m., 5 groups and 10 spots; 2 groups and 2 spots new. 27th, 11 a. m., 21 groups and 4 spots; 10 groups new and 2 groups disappeared by solar rotation. 28th, 11 a. m., 6 groups and 17 spots; 2 groups and 13 spots new. 29th, 11 a. m., 6 groups and 16 spots. 30th, 12 m., 7 groups and 21 spots.

**Errata.**—The chart below has been republished as a correction of that which appeared in the REVIEW for November, 1881.



The following is a copy of the letter of Commander R. Brown, addressed to the Chief Signal Officer and accompanying the above chart:

"Having experienced very heavy weather during my last passage from Liverpool to Boston, and particularly on the 23d ult., when we encountered quite a hurricane, I herewith enclose you a diagram, with the ship's position, direction of the wind, (as per arrows,) and the heights of the barometer, with a few remarks on the same. Tuesday, 22d of November, noon, strong gales from northwestward, which had been blowing much the same for the previous 24 hours, barometer ranging between 28.90 and 29.36. Towards midnight the wind fell calm. Then a light air sprung up from the south, veering towards the south-eastward; weather very dark, much lightning all round, more so towards the southeastward; no thunder; several *composants*, i. e., St. Elmo lights on the yards and stays, glass falling rapidly and sea very high and turbulent. 8 a. m., strong gale from SE., with snow and hail squalls. 10 a. m., blowing a hurricane from E.; squalls terrific, with terribly high and confused sea. Kept ship running before, it would have been highly dangerous to attempt to round too. Noon, 23d, glass rising rapidly; blowing as hard as ever; sea a complete mass of spindrift, high and awfully confused; squalls succeeding each other rapidly and roaring with their violence. 3 p. m., weather breaking. 4. p. m., wind NNW., rounded too, ends strong, gale from northwestward, with a high confused sea; obliged to keep ships stem on and steam easy. This weather continued much the same till the evening of the 24th, wind from the same quarter NW., when it moderated and went round to the southward for about 12 hours; it then got back to the northwestward,